Printed Page:- 04 **Subject Code:- BBT0301**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024 - 2025)

Subject: Biochemistry

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. In the phosphate buffer system, what is the conjugate base of H2PO4-? (CO1, K1) 1

(a) H2PO3-

(b) HPO43-

(c) HPO42-

(d) HPO4-

1-b. Which of the following salt is basic? (CO1,K1) 1

(a) HOCl

(b) NaOCl

(c) NAHSO4

(d) NH4NO3

1-c. Which of the following is not an important precursor of glucose in animals? (CO2,K1) 1

(a) Lactate

(b) Pyruvate

(c) Glycerol

(d) Glucose-6-phosphate

1-d. How many molecules of ATP are consumed during the initial investment phase of glycolysis? (CO2,K1) 1

(a) 1

(b) 2
(c) 3
(d) 4

1-e. Arachidonic acid is a precursor of.....(CO3,K1) 1

(a) Thromboxane
(b) Leukotrienes
(c) Prostaglandins
(d) All of the above.

1-f. Hardest wax which also known as queen of wax .....(CO3,K1) 1

(a) Carnauba wax
(b) Spermaceti
(c) Beeswax
(d) Wax on leaf cuticle

1-g. Which enzyme catalyzes the conversion of alpha-ketoglutarate to glutamate in transamination reactions? (CO4,K2) 1

(a) Alanine aminotransferase
(b) Glutamate dehydrogenase
(c) Aspartate transaminase
(d) Glutamine synthetase

1-h. In the urea cycle, which molecule is combined with ammonia to form urea? (CO4,K2) 1

(a) Carbon dioxide
(b) Glutamate
(c) Citrulline
(d) Aspartate

1-i. What is the significance of phosphodiester bonds in DNA replication? (CO5,K2) 1

(a) They prevent unwinding of the DNA double helix
(b) They stabilize the DNA helix structure
(c) They connect complementary bases
(d) They catalyze the synthesis of DNA

1-j. Phosphodiester bonds are formed between.....(CO5,K2) 1

(a) Nitrogenous bases
(b) Sugar molecules
(c) Phosphate groups
(d) Hydrogen atoms

2. Attempt all parts:-

2.a. How does temperature affect the ionization of water? (CO1,K1) 2

2.b. What is the pentose phosphate pathway, and where does it occur in the 2

	cell? (CO2,K1)	
2.c.	Define the role of genetics in obesity. (CO3,K2)	2
2.d.	What is the primary function of proteins in biological systems? (CO4,K2)	2
2.e.	Why is the balance between ribonucleotides and deoxyribonucleotides crucial in the cell? (CO5,K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Calculate the pH of a solution containing 0.05 M ammonia (NH3) and 0.1 M ammonium chloride (NH4Cl). (Given: pKa=9.25pKa=9.25). (CO1,K4)	6
3-b.	A solution contains 0.05 M acetic acid (CH3COOH) and 0.1 M sodium acetate (CH3COONa). Calculate the pH of the solution. (Given: pKa=4.76pKa=4.76). (CO1,K3)	6
3-c.	Draw the structure of triose, tetrose, pentose, hexose (1 each). Explain. (CO2,K2)	6
3-d.	Differentiate between type 1 and type 2 diabetes. (CO2,K2)	6
3.e.	Elucidate the role of acetyl-CoA carboxylase in fatty acid biosynthesis. (CO3,K2)	6
3.f.	Compare the tertiary structures of globular and fibrous proteins, highlighting how these structural differences relate to their respective functions. (CO4,K3)	6
3.g.	How does ATP serve as a universal energy currency in cellular reactions and metabolic pathways? (CO5,K2)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Elucidate the unique structure of water molecules. Explain the concept of surface tension in water. How does it arise, and what biological significance does it have? (CO1,K2)	10
4-b.	Explain the functioning of buffers in biological systems. Provide examples of buffer systems and explain how they resist pH changes. (CO1,K1)	10

5. Answer any one of the following:-

5-a.	Provide a step-by-step explanation of the pentose phosphate pathway, including its significance. (CO2,K2)	10
5-b.	Describe how the TCA cycle contributes to the production of ATP, NADH, and FADH. Explain the key reactions and intermediates of the citric acid cycle (TCA cycle). (CO2,K2)	10

6. Answer any one of the following:-

6-a.	Explain the psychological factors contributing to obesity, including emotional eating, stress, and societal influences. (CO3,K2)	10
6-b.	Describe the structure and functions of the electron transport chain (ETC) complexes, explaining the flow of electrons and the formation of the proton gradient. (CO3,K2)	10

7. Answer any one of the following:-

7-a.	Discuss the structural and functional differences between glucogenic and ketogenic amino acids. (CO4,K2)	10
7-b.	Elaborate on the significance of the hydrophobic effect in protein folding. How does it influence the organization of amino acids in the interior of a protein? (CO4,K3)	10

8. Answer any <u>one</u> of the following:-

8-a.	Evaluate the importance of maintaining balanced pools of ribonucleotides and deoxyribonucleotides for cellular function and genome integrity. (CO5,K4)	10
8-b.	Describe the de novo synthesis pathways for purines and pyrimidines, discussing the significance of precursor molecules and regulatory checkpoints.(CO5,K2)	10